Reader Notes

1. **For what roles are OSIS-based systems suitable, and what new roles will emerge?**
2. **How will other architectures compete with Intel for OSIS dominance?**
3. **How will tools and technologies for OSIS management evolve?**
4. **How can enterprises select the right vendors for their OSIS systems?**

What are OSISs?

Operating-system-independent servers (OSISs) are designed primarily for file-and-print services or application serving — for which operating systems from other companies are available.

As a practical matter, we consider OSIS systems to be servers for which "shrink-wrapped" versions of at least Novell's NetWare or Microsoft's Windows NT are available. Additional operating systems might include SCO Unix, Solaris or OS/2.

Popular CPU architectures, on which systems that conform to this OSIS definition are based, include: Intel's X86, Motorola's PowerPC 6XX, Silicon Graphics/MIPS' RX000 and Digital's Alpha AXP.

Reader Notes

- **NT will be strategic.** Microsoft's NT and Unix will ship at nearly equivalent value in the server market by 2000, with Windows/NT dominating the market for servers below $30,000 in shipped value.
- **Unix will be displaced upward.** OSIS systems will displace proprietary Unix systems for low-end and traditional midrange application server use during the next five years. By 2000, proprietary and Unix-based systems will compete primarily for high-end uses.
- **OSIS will offer improved availability features.** High-availability features (e.g., clustering, automatic recovery and transaction rollback) will be standard deliverable functionality in OSIS systems by 2000.
- **Intel will drive the IT hardware market.** During the next five years, Intel's architecture labs will be the pre-eminent designer (but not necessarily builder) of systems. Intel components will be the basis for systems with the potential to serve 80 percent of the commercial-computing market's requirements.
- **OSIS systems will become upgradable.** As the market for OSIS systems matures, vendors will guard their system's footprints by providing in-cabinet upgrades. This will become common during the next three years.

Source: Gartner Group

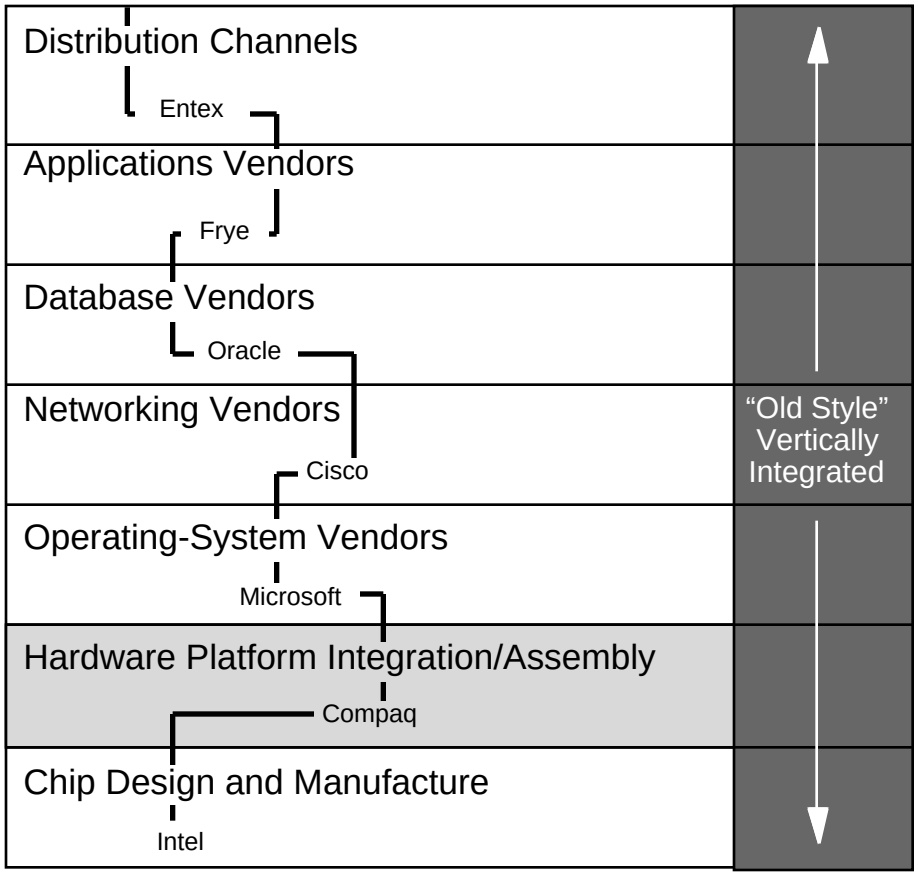
Key Drivers in the IT Industry:

Standardization: CMOS technology, on which the IT revolution is based, has had better-than-50-percent performance improvements annually, but this comes at an enormous price. Only high-volume CMOS component makers will remain competitive. This volume requirement will drive industry standardization.

Componentization: In monolithic systems, complexity rises more quickly than function improves. Monolithic systems (software and hardware) will continue to give way to systems with more granularity and less component complexity.

Parallelization: As component (computational) costs drop, decomposing a single problem into many smaller problems (and bearing the added overhead) will be less expensive than building higher-capacity serial systems.

Self-organization: As systems expand in complexity and scope, management overhead grows disproportionate to it benefits. Complex systems will increasingly rely on components that interact according to simpler, self-directing rules.



Source: Gartner Group

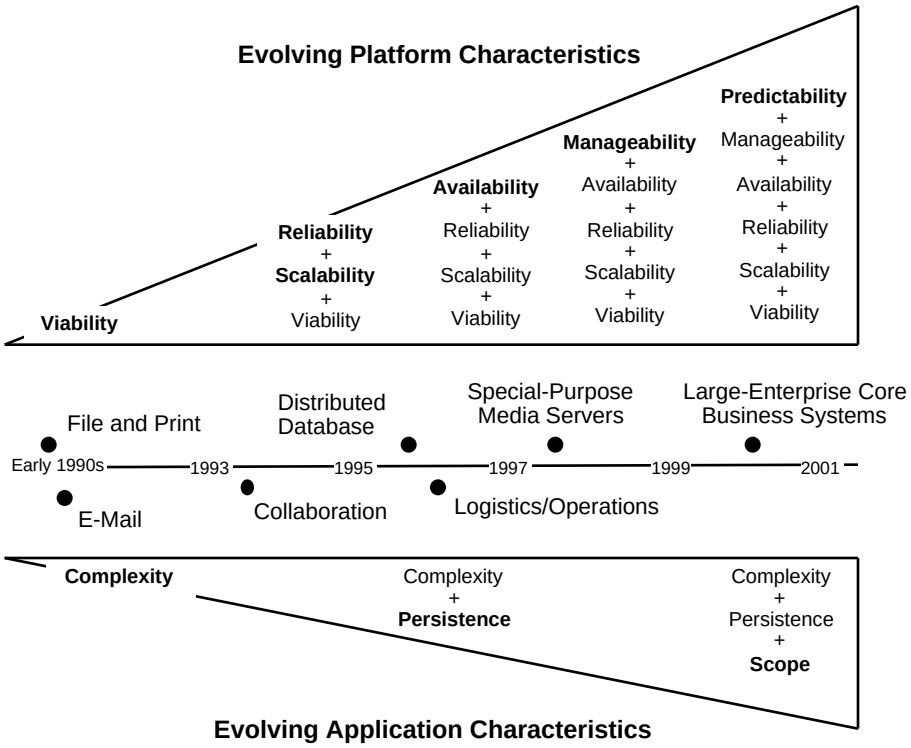
Supply chain disaggregation is as old as the first industrial revolution. Since the turn of the century, when U.S. firearms manufacturer Remmington introduced "interchangeable parts," complex systems have been built from multiple vendors' components.

Fifteen years ago, old-style vertically integrated firms (e.g., IBM, Digital and Unisys) still dominated what we now know was a nascent IT industry. Systems were designed around custom components to run proprietary operating systems, software subsystems and applications.

Just as Remmington's interchangeable ammunition clips and firing mechanisms changed gun manufacturing, CPU chips radically changed the IT industry. Today, we are moving toward a new industry structure in which multiple companies compete to add value to one another's products. Many bring unique skills and products to the value chain. Vertically integrated firms are unbundling product sets and forcing each piece to stand on its own in the market. Users have more choices and better products today, but the risks are greater.

For what roles are OSIS-based systems suitable, and what new roles will emerge?

Reader Notes



Definition:
Predictability is the tendency of a system to behave as expected.

Source: Gartner Group

Applications can be characterized three ways: 1) *complexity* of code or logic; 2) *persistence* from one-time use to many years; and 3) *scope* from individual user to the entire enterprise.

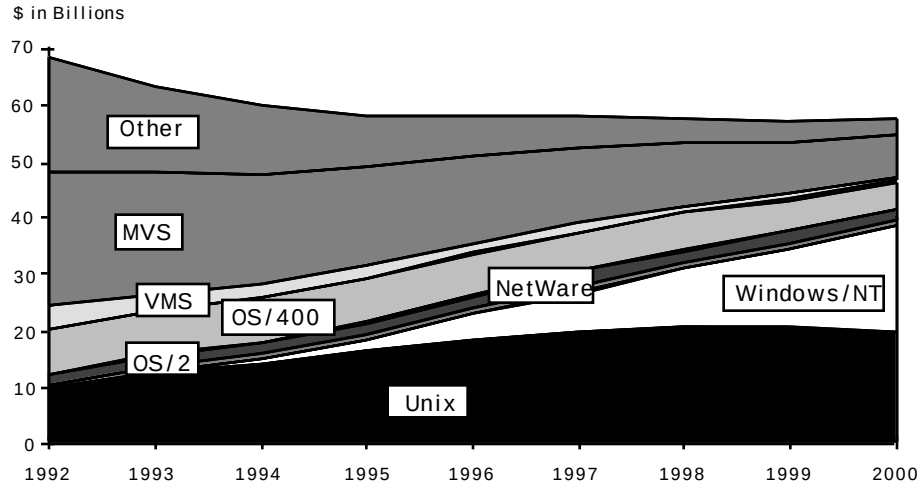
PCs and "PC servers" began as platforms for relatively complex (compared to mainframe-terminal systems) applications with little persistence and even less scope. This befitted a technology whose *viability* was yet unknown.

Today's OSIS systems are viable — rapidly gaining the *scalability* and *reliability* needed to deploy applications of long-term (persistent) enterprise importance. For most large enterprises, however, OSIS systems will not achieve the levels of *availability* and *manageability* needed to increase the scope of supported applications beyond the departmental level for another 18 months (0.8 probability). As the century draws to a close, OSIS systems will be *predictable* enough for full enterprise-scope applications (0.7 probability).

By 2000, OSIS servers will constitute approximately one-third of all server/host spending (0.7 probability).

Reader Notes

Worldwide Server/Host Spending by Operating System



Source: Gartner Group

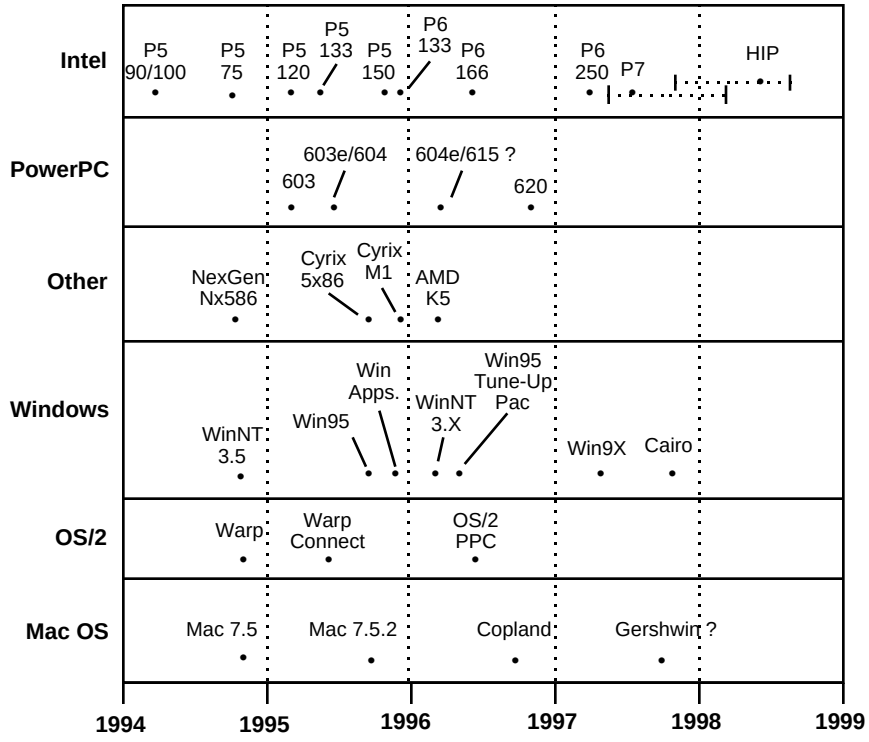
Key Issue: For what roles are OSIS-based systems suitable, and what new roles will emerge?

By 2000, several of today's hardware-independent operating systems (e.g., NT, OS/2, UnixWare and NetWare) will be sufficiently manageable, available and, most important, predictable for large-enterprise core business systems (0.7 probability). Given market momentum, ISV acceptance and user sentiment, NT is the front-runner.

Nevertheless, we believe hardware-independent operating systems and OSIS hardware will garner only one-third of the total operating-system market. Proprietary and Unix operating systems will each garner one-third of the market as well.

Despite the lag in acceptance, OSIS system spending will grow explosively. NT, in particular, will dominate the market for servers of less than $30,000 in value (0.8 probability).

Microprocessor/Operating-System Timeline



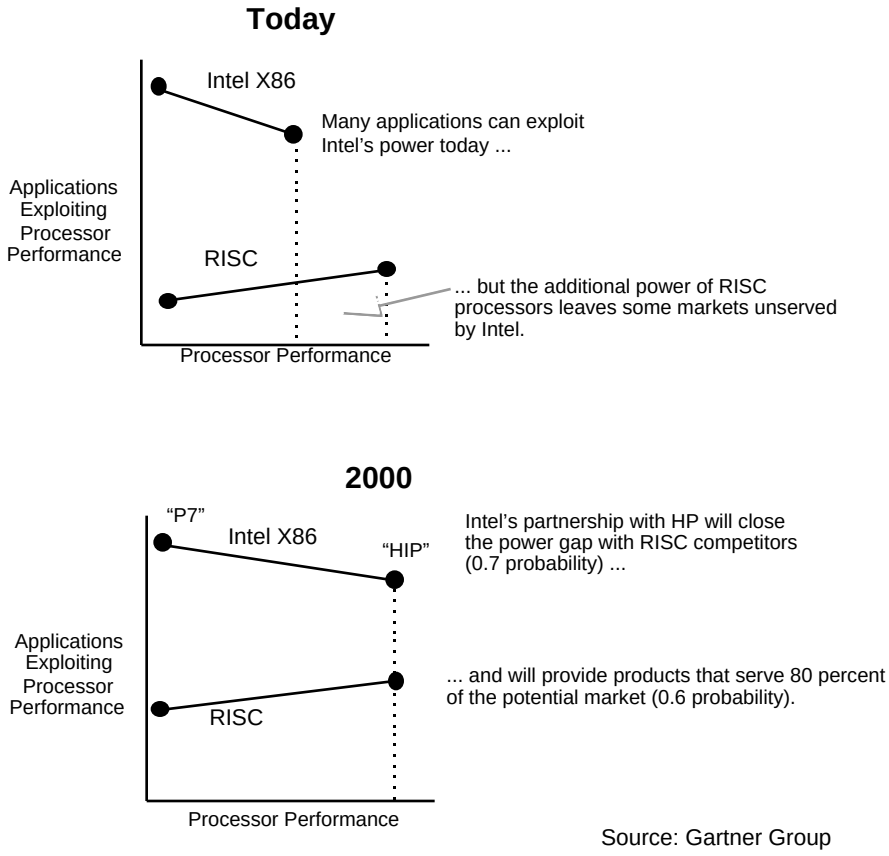
Source: Gartner Group

By the early 1900s, coal and the coal miner were at the base of the rising wealth and power of the transformed industrial nations of the United States, Britain and Germany. Water power had once constrained manufacturing to riverbanks, but coal-fueled steam-powered engines freed manufacturing to grow in new areas and develop more-complex systems.

The “coal” fueling change in today’s IT industry is the microchip, and Intel is at the base of much of the economic activity in the IT industry, due to the ubiquity of its 80X86 microchip. By 1999, Intel will further develop its 80X86 microchips from CISC to a new architecture with the best of CISC and RISC design principles (0.9 probability). During the same period, Microsoft will further develop its operating systems and business model to depend less on Intel’s architecture. The market turbulence these two vendors’ strategies cause will be a central feature (and challenge) of the IT market during the next five years.

By 2000, Intel's CPU architecture will form the basis of systems with the potential to serve 80 percent of the commercial-computing market's requirements (0.6 probability).

Reader Notes



Source: Gartner Group

Key Issue: How will other architectures compete with Intel for OSIS dominance?

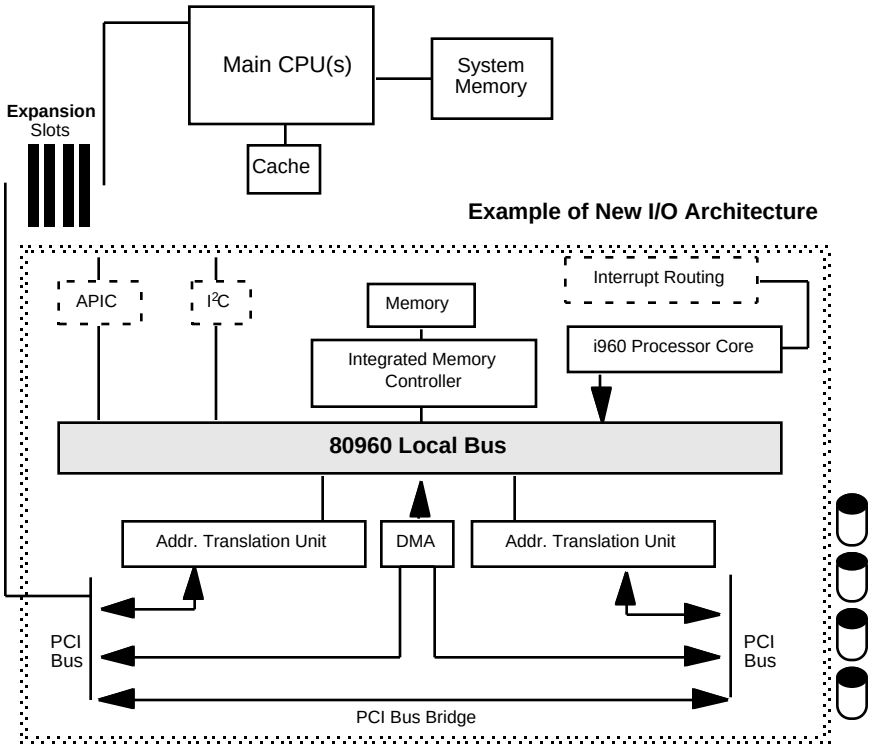
Has Intel invested wisely in its expensive P6 technology instead of RISC? We believe it has, given its choices. Today, Intel does not command the ramparts of high performance (X-axis), but it has a huge portfolio of applications that exploit its price / performance advantage.

P6-based systems will not provide performance equal to the fastest RISC chips, but they should meet the price / performance needs of most of its potential served market.

Intel's rapid climb up the power curve with P6 will make migration from Intel-based architectures to RISC alternatives unnecessary in most cases. The P6's higher system throughput and better scalability should contain most file-and-print requirements, and many application server requirements, until Intel's next generation of processors. In most cases, an architecture change from Intel to RISC will be driven more by the need for a more mature operating environment (e.g., Unix) than by raw power requirements.

By mid-1996, new I/O subsystems will bring high-end OSIS hardware in line with traditional midrange capabilities (0.8 probability).

Example of Future High-End OSIS Architecture



Source: Gartner Group

Key Issue: How will other architectures compete with Intel for OSIS dominance?

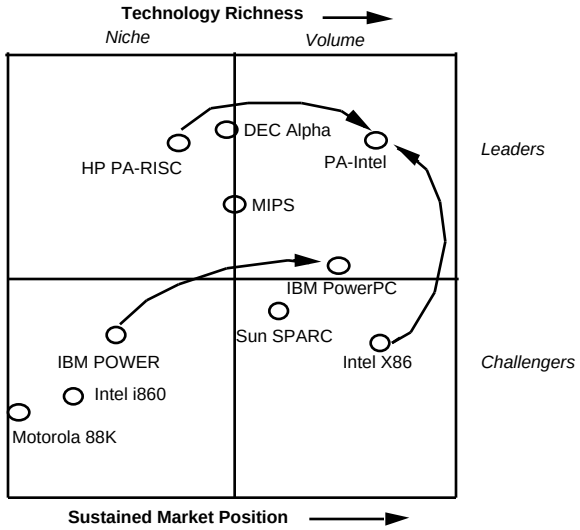
Most Intel-based OSIS systems still display their PC origins in the way I/O traffic is processed. Even in systems with bus-mastering and smart controller cards, the CPU must frequently process interrupts, or poll for activity, from devices such as disk array cards and network interface cards.

By mid-1996, departmental and application/consolidation server vendors will incorporate tightly coupled I/O offload processors such as Intel's i960 RP. This I/O processor will handle many of the I/O interrupt and polling tasks the main CPU now handles.

For example, four of today's best intelligent-LAN 100-Mbps Ethernet cards (many actually based on the i960 processor) operating concurrently consume about 60 percent of the processing capacity of a dual 100-MHz Pentium/PCI to achieve an aggregate data rate of just under 40 Mbytes per second.

Reader Notes

As processor chips are incorporated into additional "embedded" applications, only high-volume architectures will survive (0.7 probability).



Technology	Business Model	Weakness	User Risk	Arch. Cont. (Prob.)
IBM POWER	tech/scie. comm. scaling	costly; niche	dead end	0.3
IBM PowerPC	OS and arch. indep.	compat., timing	OS selection	0.7
DEC Alpha	price/perf. lead; inst. base	vendor viability	vendor/mkt. support	0.55
Sun SPARC	vols., fab. partners	technology lag	next gen. transition	0.7
HP PA-RISC	system integration	volume; partners	convergence with Intel	0.3
MIPS	mkt. breadth, partners	volume; apps.	nonstrategic	0.65
Intel X86	RISC layered on CISC	high-end servers	HP RISC gamble	0.8
Intel i860	embedded	vendor support	dead end	0.2
Motorola 88K	commercial servers	tech. and timing	apps.	0.0
Intergraph Clipper	workstation/servers	perf., breadth	dead end	0.0

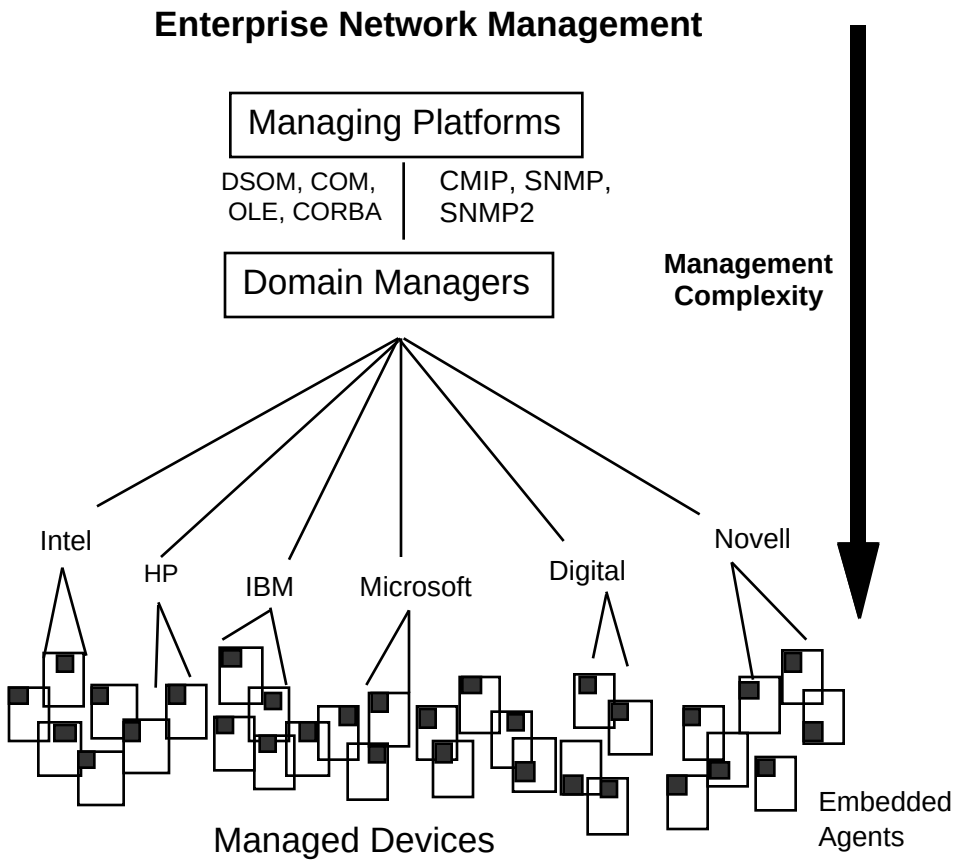
Source: Gartner Group

Key Issue: How will other architectures compete with Intel for OSIS dominance?

In his well-known "Moore's Law," Intel co-founder Gordon Moore says microprocessor performance will double every two years. This has been true for nearly 30 years, seeing the IT industry through a performance improvement of about 32,000 times (over four orders of magnitude).

With CMOS technology, Moore's Law is likely to hold true for another five to seven years, after which further size reductions, increased component density and, thus, exponential improvements in performance will be difficult physically and economically.

Most of the architectures listed above will not reach this final exponential growth "wall." The immense cost of making another leap in density and speed will foreclose the market. By 2000, only high-volume chip architectures (millions of units per year) will be economically viable (0.9 probability), or possibly even producible (0.5 probability).



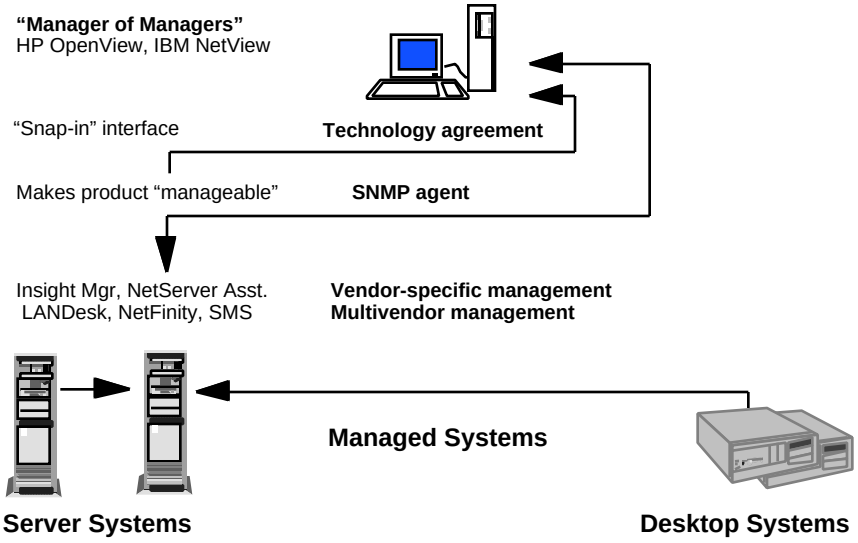
Source: Gartner Group

The mass-production techniques of the industrial revolution soon demanded new organizational and management structures to take full advantage of parts interchangeability. By 1913, Henry Ford had begun producing automobiles on an assembly line. Meanwhile, Alfred Sloan of General Motors developed management techniques that became the foundation for 20th-century business organization. In comparison to the 19th-century craftsman, who saw his product through from start to finish, the systems of Ford and Sloan broke the larger production process into pieces. Managers coordinated those pieces to produce the whole, while leaving some decision making at lower levels in the enterprise.

IT systems management tools are at a similar turning point today. Centralized systems have given way to decentralized systems during the past 10 years. The next step is management software that enables decentralized systems to manage themselves while maintaining central coordination.

By 1997, bundled server management software will become "management middleware" providing only server instrumentation for higher-level enterprise managers and little product differentiation (0.7 probability).

Reader Notes



Proprietary or SMI-specified	**Management information block (MIB)**	DMI-specified
Operating-system-specified	**Service Layer**	Operating-system-specified
Proprietary	**Component/ instrumentation layer**	Proprietary/ third party
Disk array, NIC, thermal, power	**Components**	PC, disk drive serial no.

Source: Gartner Group

Key Issue: How will tools and technologies for OSIS management evolve?

Today, OSIS vendors are using server management software as a point of product differentiation in what is increasingly a commoditized market. Strategies vary. HP offers good server management up through its enterprise management offerings while waiting for the DMI to provide a "hook" for desktop management. Compaq has elected to enable proprietary desktop management capabilities, and it relies on partners for enterprise management. IBM is trying desktop and enterprise management "hooks," but it has further integration work to do in both directions.

Although server management can provide differentiation today, compatibility with major enterprise management platforms (e.g., OpenView, NetView and Microsoft's SMS) are imperative. By 1997, OSIS system management tools will become a "management middleware" layer that connects OSIS systems to broader enterprise management consoles.

Users should assess server management software on its ability to support multiple environments.

Reader Notes

	Insight Manager	LANDesk	NetFinity	Open View	SMS
Managed system types					
Servers	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx
Desktops		xxxxx	xxxxx	xxx	xxxxx
Mobile computers		xxxxx	xxxxx		xxxxx
Multivendor management		xxxxx	xxx	xx	xxxxx
Managed system OS support					
AIX					
Macintosh					xxx
NetWare	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx
OS/2 and LAN Server	xxxxx		xxxxx	xxx	xxxxx
Windows 3.1	xx	xxxxx	xxxxx		xxxxx
Windows NT	xxxxx			xxx	xxxxx
Managed system OS support					
AIX					
Macintosh					
NetWare					
OS/2 and LAN Server			xxxxx		
Windows 3.1	xxxxx	xxxxx	xxxxx	xxxxx	
Windows NT	xxxxx			xxx	xxxxx
Network protocols support					
Asynchronous	xxxxx	xx		xxxxx	
IPX	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx
NetBIOS		xxxxx	xxxxx		xxxxx
TCP/IP	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx

Versions:
Compaq Insight Manager 2.3
Intel LANDesk 2.1
IBM NetFinity 3.0
HP OpenView/NetServer Assistant 2.1
Microsoft SMS 1.0

Source: Gartner Group

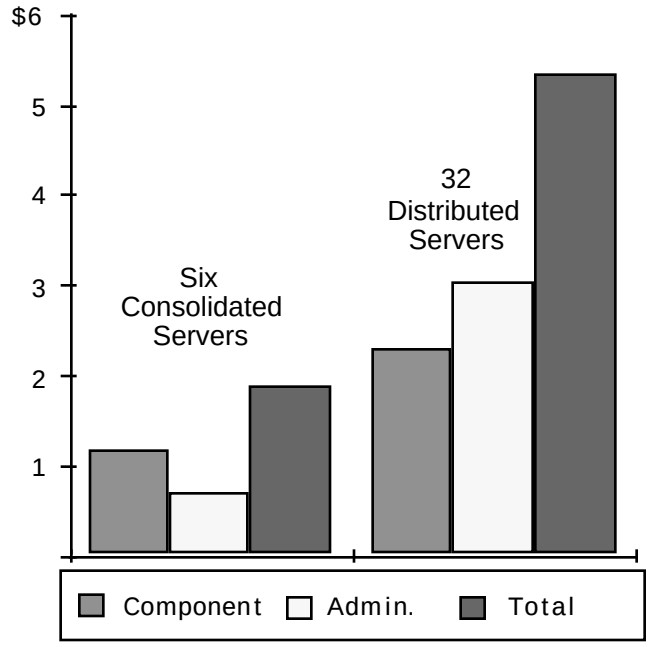
Key Issue: How will tools and technologies for OSIS management evolve?

Functional convergence in OSIS management software is well underway, but the pre-existence of an enterprise management platform (e.g., OpenView, NetView 6000 or SunNet Manager) is still a major consideration.

Reader Notes

By consolidating LAN environments (physically or logically), enterprises will reduce overall network expenses by as much as 15 percent (0.7 probability).

Server Consolidation Cost Comparison
(U.S.$ in Millions)



45 percent savings in component costs
80 percent savings in personnel costs

Caution: This is *not* total network savings; it reflects component costs and administration.

Source: Gartner Group

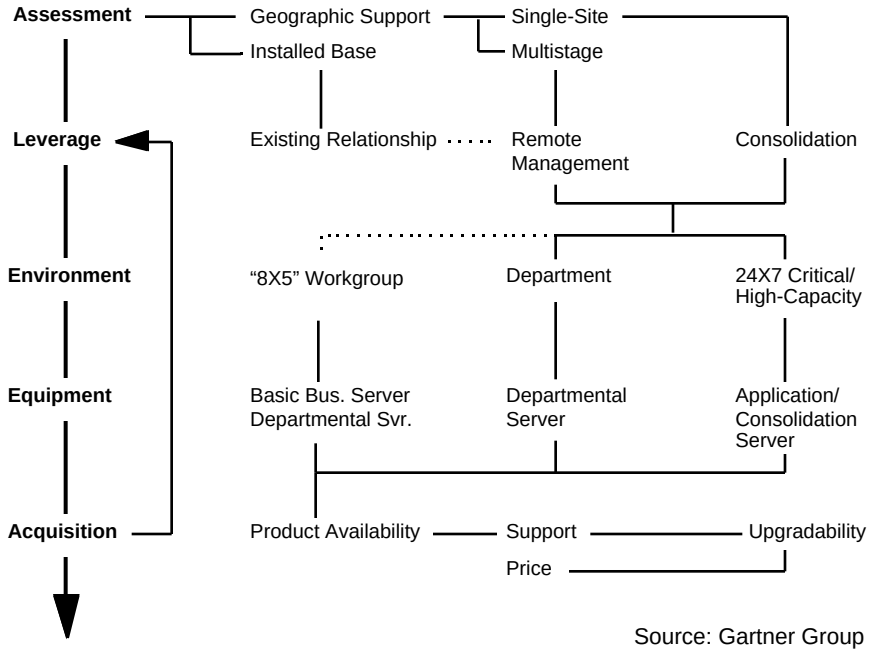
Key Issue: How will tools and technologies for OSIS management evolve?

Recently, there has been a lot of interest in the value (if any) of consolidating multiple, smaller LAN infrastructure servers into centrally managed large or superlarge servers. There are two reasons for this. First, the number of servers and network change requests in many environments has become unmanageable, and many companies are looking to reduce this complexity via centralization. Second, as servers and LAN infrastructure have become the centerpiece of core IT service delivery, components purchasing and management responsibility have moved from departments to more-traditional, central IT management.

The chart above represents an effort to consolidate 32 distributed servers onto six high-end superservers. While this may be aggressive in some enterprises, small departmental servers are often severely underused, and they are prime targets for consolidation. This consolidation decision cannot be made lightly, because relocating server resources may have a profound impact on the underlying infrastructure or on predefined agreements for customer service levels.

How can enterprises select the right vendors for their OSIS systems?

Reader Notes



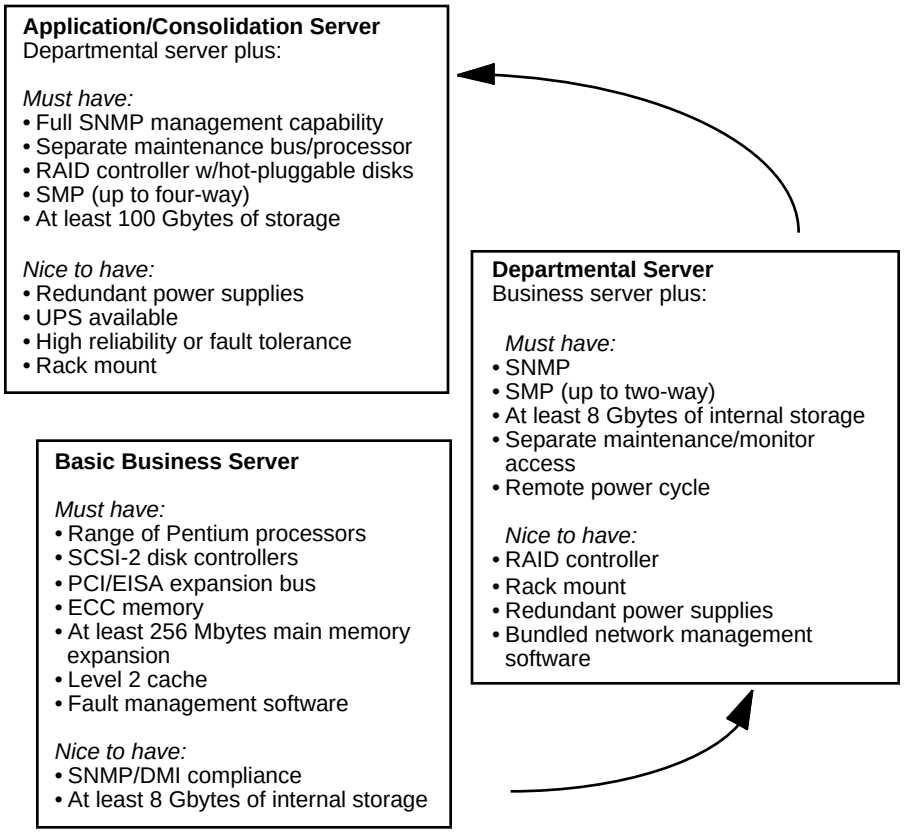
Source: Gartner Group

To see how far OSIS servers have come from their roots as "PCs turned sideways," one must only look at price's position in the decision tree. While price is still important in vendor selection, the highly competitive OSIS market keeps prices in a fairly narrow band from manufacturers that offer comparable products and services. Today, buyers must look beyond the box to determine which products and services are indeed comparable.

Vendor selection should start with an assessment of existing conditions in the enterprise. What leverage is available from vendor relationships, enterprise management systems or consolidation goals? Equipment selection is the next step — based on the supported applications' requirements. The final acquisition phase should begin with a careful check of product availability. Products are not always as available as advertised. Can the vendor provide the support (service and integration) required? Finally, is the price competitive?

The OSIS market has evolved into three distinct segments.

Reader Notes



Note: Feature recommendations are additive for each successive segment. For example, departmental servers should have all the features listed, plus all those listed under business servers.

Source: Gartner Group

Key Issue: How can enterprises select the right vendors for their OSIS systems?

We have identified three Intel-based server market segments.

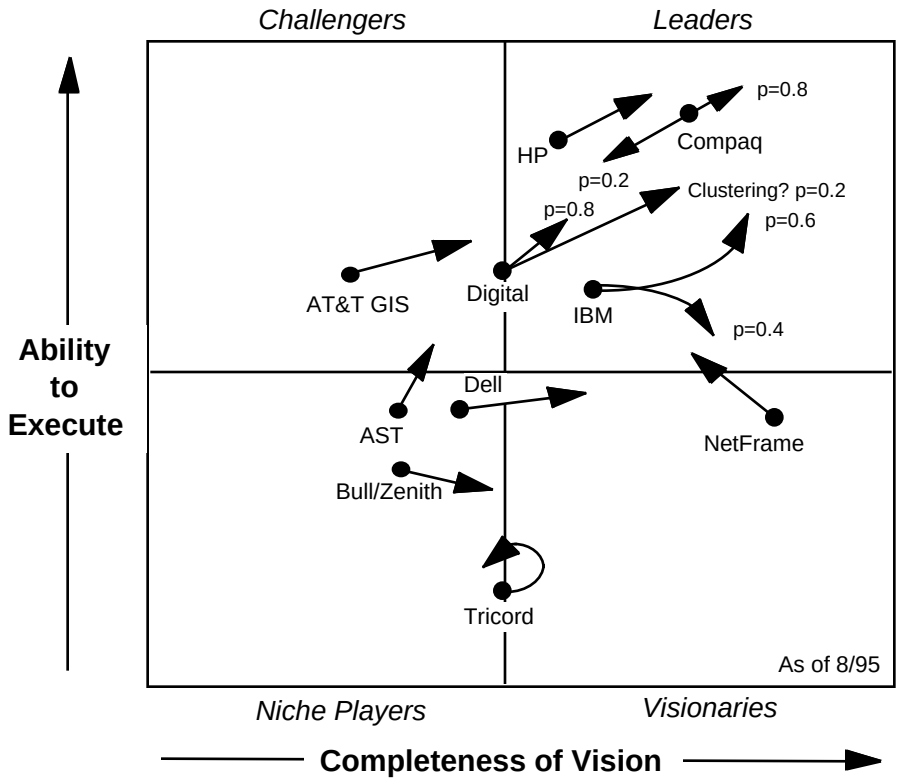
1. Basic business servers have the features needed for a single server for a small business, but they cannot be managed remotely.

2. Departmental servers constitute the majority of systems used in midsize and large enterprises. They need remote management capabilities and typically provide file, print and E-mail services for between 50 and 200 users.

3. Application/consolidation servers are a small but growing segment of the Intel server market. They are typically used as: 1) a central system(s) in midsize businesses that have outgrown several smaller departmental servers, 2) a consolidation platform for multiple LAN servers into the data center, or 3) an application server — often instead of a Unix minicomputer — for query-intensive or compute-intensive client / server applications.

By 2000, server vendors will be almost indistinguishable on a hardware basis; service, support, management and systems integration will be key differentiators (0.8 probability).

Reader Notes



Source: Gartner Group

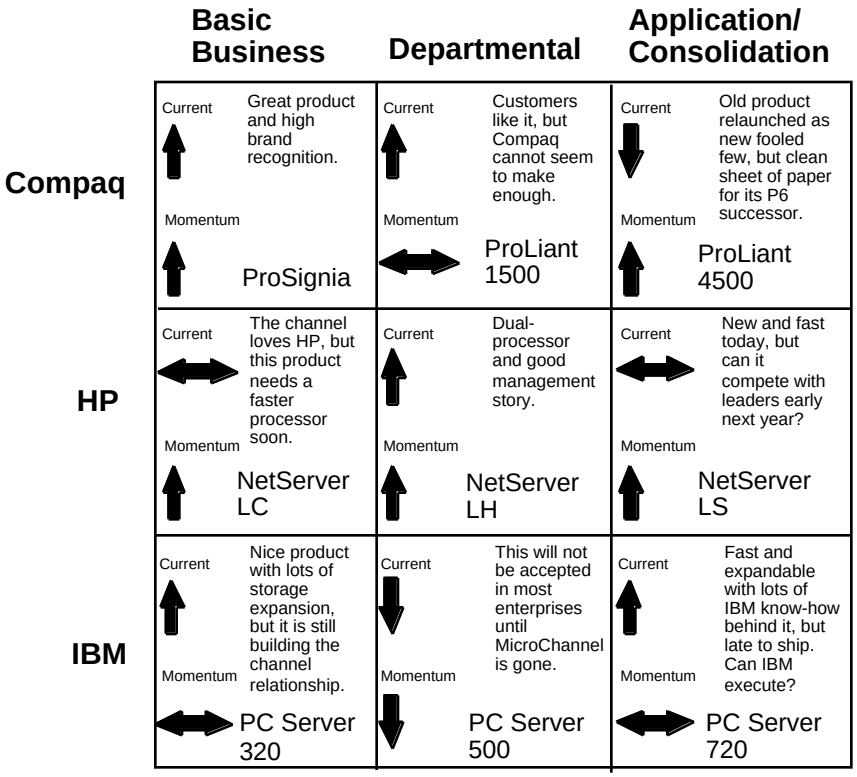
Key Issue: How can enterprises select the right vendors for their OSIS systems?

Intel is very much in charge of basic system architecture decisions for OSIS systems, so most product differentiation will come from broad geographic service availability, good pre-sales and post-sales support, and systems integration capability.

In service, the top-three market share vendors (e.g., Compaq, HP and IBM) and most other vendors will have developed or contracted for basic service capabilities worldwide by 1997 (0.8 probability). In pre-sales and post-sales support, the old-line computer firms (e.g., AT&T, Digital, HP and IBM) have the upper hand today, but high costs and continued downsizing may eventually clear the way for the manufacturer/distributor model (0.7 probability). Integration will probably be the most important difference between companies. Old-line computer vendors own many of the skills — and much of enterprise installed base — needed to develop successful integration practices. However, powerful manufacturers (e.g., Compaq) and niche players could ally with systems integration companies to level the playing field.

The products and momentum of the top-three market share vendors.

Reader Notes



Source: Gartner Group

Key Issue: How can enterprises select the right vendors for their OSIS systems?

The top-three vendors have garnered 61 percent of the market — Compaq has 27 percent, IBM has 18 percent, and HP has 16 percent.

Reader Notes

- **For what roles are OSIS-based systems suitable, and what new roles may emerge?**

  By 2000, OSIS systems will be sufficiently available, manageable and predictable to run large enterprises.

- **How will other architectures compete with Intel for OSIS dominance?**

  Intel has a major advantage today; its volumes and profitability allow it to spend huge amounts of money to build fast components. Most existing applications will not need to move off of Intel's architecture.

- **How will tools and technologies for OSIS management evolve?**

  OSIS system vendors today use server management software as a product differentiator. These "domain" managers will become middleware for more-complete enterprise management systems.

- **How can enterprises select the right vendors for their OSIS systems?**

  Value-added capabilities (e.g., service, support and integration) will be key vendor differentiators.